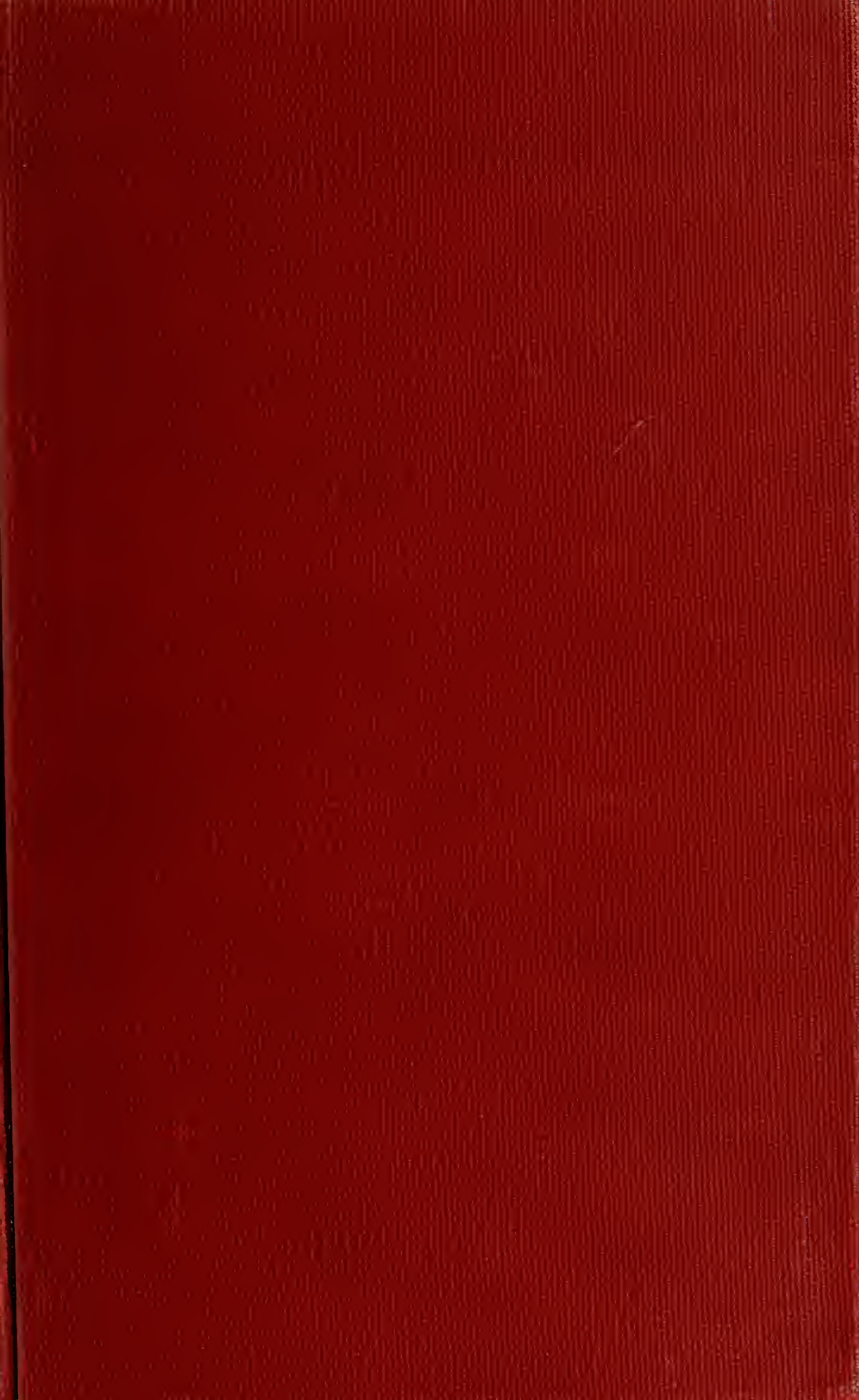
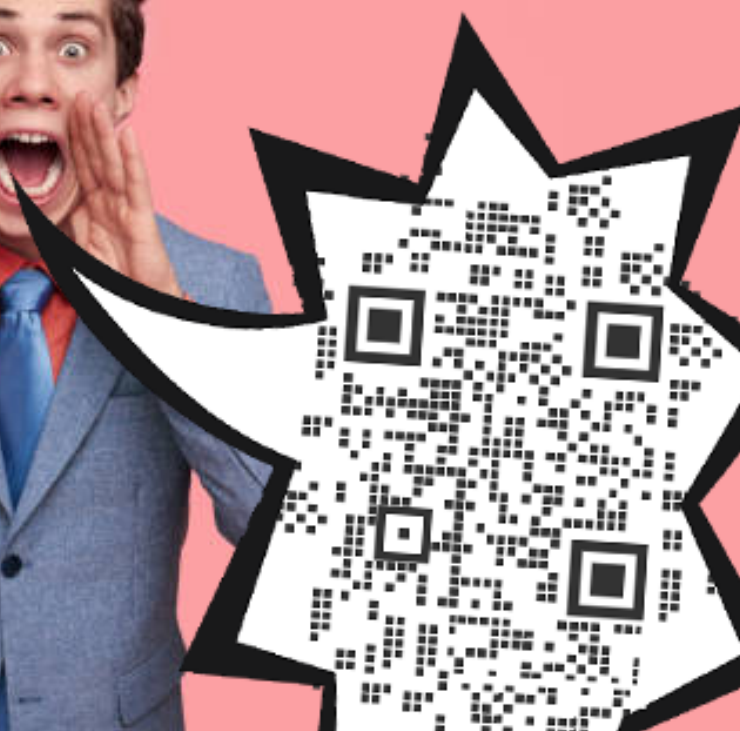
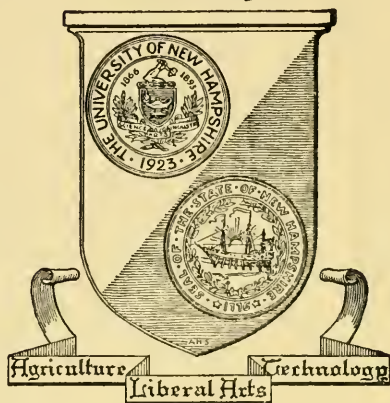




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THE PLACE OF WOODLAND IN THE FARM ORGANIZATION IN COOS COUNTY, NEW HAMPSHIRE

By

JOHN M. CHANDLER

Assistant Forest Economist,

Bureau of Agricultural Economics

New Hampshire Agricultural Experiment Station

University of New Hampshire

in cooperation with

United States Department of Agriculture

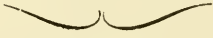
Bureau of Agricultural Economics

Durham, N. H.

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THE PLACE OF WOODLAND IN THE FARM ORGANIZATION IN COOS COUNTY, NEW HAMPSHIRE

The agriculture of Coos County centers largely around a few products and the demand for farm labor is seasonal. The success of many farmers is governed by the ability to utilize their labor and equipment to advantage during off seasons. In trying to solve their problem, they have associated themselves, in one way or another, with the forest resources. Some have succeeded through ownership of forest land while others have found it expedient to relate themselves to timber resources owned by others.

In earlier years, tracts of forest land owned by other individuals and by corporations offered opportunity for off-the-farm employment. The type of work varied greatly, depending upon circumstances. Some individuals acted as contractors during the winter months, accepting responsibility for an entire operation. Others hired out as choppers, teamsters, or performed any one of a number of tasks necessary to getting the raw material from "stump to stick." Probably of greatest value to farmers was the function of transportation, done mainly with horses. This particular job furnished the farmer not only an income for his labor but also additional revenue for the use of draft animals and certain equipment which would otherwise be idle.

During recent years technological developments and depletion of timber resources have considerably altered the situation. Logging activity has diminished until it is confined mainly to pulp and fuelwood. Tractors and trucks have replaced draft animals in transportation, which is no longer confined to winter. Farmers who do not own forest land or who have limited timber resources have not been able fully to adjust themselves to the changed condition. Failure to make the adjustment has created a problem of using available labor and equipment during the winter months. At the same time, developments in agriculture have placed much of northeastern farming at a disadvantage, making the need for supplementary income even more acute.

Realizing these problems, the agricultural planning committees in the towns of Colebrook, Columbia, and Stewartstown in Coos County, New Hampshire, (See Fig. 1) asked that this study be made

to evaluate the possibilities of increasing net farm income, in the immediate future and over a longer period, by adjusting the farm organization to include forestry as a supplementary enterprise and by more economic use of agricultural and forest resources on the farms in the area.

PROCEDURE

A schedule of information was secured from 80 farms selected at random from the three towns. It included data concerning present farming resources and organization, hours of man and horse labor used in woodland operations during the same period, additional time available for woods work during a normal year, and the operator's interest in more woods work as a means of increasing farm income.

A recent forest survey by the United States Forest Service and cooperating agencies furnished the information about land ownership, cover types, growth rates, and volume of merchantable timber at the present time.¹ Type and ownership maps were prepared that cover very completely the farm and other small holdings in the area. No data were collected for the wildlands and scattered small lots owned by the large companies. A reconnaissance of these lands was made as a part of the present study to secure pertinent data to supplement those already collected for all other forest land. This reconnaissance was made with the assistance of a local resident having intimate knowledge of the timberland in all three towns. Although in no way as detailed as the forest survey, it did serve to indicate the amount and condition of present growing stocks on a considerable acreage and throw some light on the potentialities of that acreage to produce future crops.

One method of making woodland and its products available to a

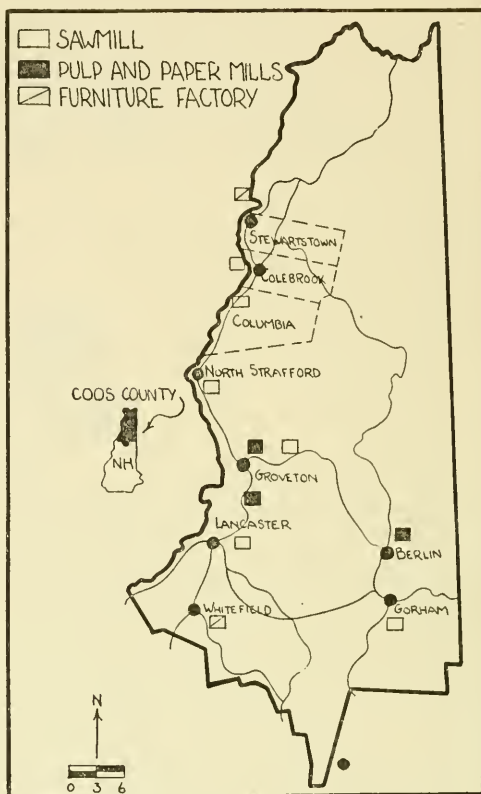


FIG. 1. MAP OF COOS COUNTY SHOWING LOCATION OF WOOD-USING INDUSTRIES AND THE TOWNSHIPS IN THE AREA STUDIED.

¹ Survey completed in 1939.

large number of people is through public ownership. Stable ownership would permit a continuity in management likely to provide the greatest use of the timber resources. In an attempt to determine the feasibility of such an approach, farmers residing in areas adjacent to the National Forest were interviewed to ascertain the success of public ownership in relating forest resources to near-by residents. It was found that a number were using the National Forest as an outlet for their spare labor, but, for the most part, they were operators of part-time or subsistence farms. Except for those located very close to this area, dairy farmers did not find it practicable to purchase stumpage on this forest because of the short time available in any one day for work in the woods. They could not travel more than two miles and still make effective use of their time.

Information concerning prices and trucking costs was obtained from local people and from the pulp mills. An attempt was made to obtain a series of prices paid and quantities of wood purchased over a period of years. Lack of adequate records prevented getting more than enough information to indicate what a normal price for wood delivered at the mill might be. Trucking charges were obtained from local truckers and from farmers throughout the area.

Certain farms, each typifying a large group, were selected for more intensive study. Alternative programs of production, based on farm management records previously collected, were worked out for these farms.² In this work the woodland management was considered along with other farm enterprises. Income expectancy was worked out for short and long time periods.

DESCRIPTION OF THE AREA

The area studied is one of the most concentrated dairy areas in the State and one likely to remain permanently in agriculture. Production of wholesale milk is the prevailing type of farming, with potatoes and forest products as the main cash crops. Farms vary in size from those at the subsistence level to commercial enterprises with large herds and commercial acreages of potatoes. Herds generally tend to be larger than in most sections of the State. Potato production has averaged about two acres per farm in recent years.

The topography of the region is rolling with rather narrow valleys and rounded hills. Pastures and fields are irregular in shape and quite often steep. Many of the farmsteads are located on the high land, and often the valleys are covered with tree growth which is contrary to what is usually found in other sections of the State.

WOODLANDS

Although the Colebrook area is one of the best agricultural areas in the State, it might also be considered a forest area. Approximately

² Woodworth, Harry C. and Hansas, Arno: *Farm Organization and Management in the Colebrook Area*, New Hampshire Agricultural Experiment Station, Bulletin 322, June, 1940.

70 percent of the total land area supports some form of tree growth. The original forest of the region was composed of a mixture of softwoods and northern hardwoods. There are still evidences of this type of growth in the wildland sections of Columbia. Logging for sawtimber reached its peak about 1900, and most of the old growth stands of any value have been cut. In recent years the main product has been pulpwood because the pulp mills can utilize much smaller material requiring less time to grow, whereas lumber requires large trees grown on a long rotation. Figures obtained from the recent forest survey³ indicate that very little timber over 80 years old remains in the three towns (See Figure 2). By far the largest acreage falls within the 41-80 year age class. About half of this acreage supports a sufficient volume of timber to be considered merchantable according to the standards set up for the forest survey.⁴

The farm woodlands of the area fall roughly into three general classes: (1) even-aged spruce and fir stands originating on abandoned agricultural lands; (2) northern hardwoods and spruce-hardwoods; and (3) nearly pure stands of sugar maple. Of much less immediate significance are the scattered stands of aspen and paper birch which have followed cutting of other species, and the cedar and tamarack found on wet sites.

The condition of the growing stock varies greatly on different holdings. The fact that half the acreage in the age class that should be merchantable contains less than two thousand board feet per acre indicates that cutting has been heavy. Because nature has been unusually generous, repeated cuttings have not resulted in barren areas such as exist in other parts of the State. The inherent ability of the local species to reproduce either from seed or sprout assures regeneration of a sort.

When advanced reproduction of desirable species and size has been adequate at the time of cutting and protected during logging

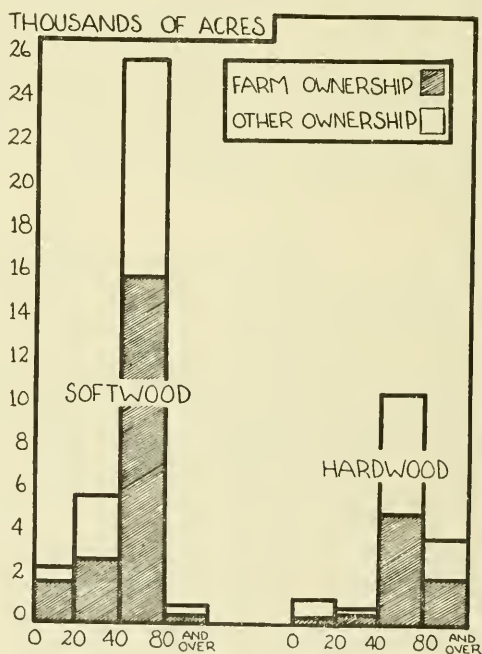


FIG. 2. WOODLAND ACREAGE IN THE AREA STUDIED BY TYPES AND AGE CLASSES.

³ United States Forest Service, et al., The Coos-Essex Project, A Sustained Yield Management Plan Timber Survey, unpublished report.

⁴ Two thousand board feet or more per acre.

operations, results have usually been reasonably satisfactory in the spruce and fir types. In other instances the character of the growth has made clear-cutting in these types impracticable. Although the majority of the stands are even-aged, there may be a wide range in diameter classes. When the cut has been limited to sizes of material that can be removed economically, the residual stand per acre is often sufficient to form the nucleus of a new crop. Where conditions were not as favorable when cuttings were made, the areas have been taken over by temporary species, to be followed much later by a more permanent type of growth. The result has been the lengthening of the time between cuts of merchantable material from the same land. Sometimes these transition species can be marketed but more often they have no market value and can be used only for fuelwood, a use to which they are not well suited.

Repeated cuttings in the hardwood types have led to serious depletion of growing stocks. The practice of taking only the best trees has left residual stands of little commercial importance except to meet the limited demand for fuelwood. It is becoming increasingly difficult for local industry to secure, near at hand, the quality of hardwood essential to efficient manufacture.

MARKETS FOR FOREST PRODUCTS

The area has a number of outlets for its forest products. Several pulp and paper mills are located within trucking distance and others can be reached by rail, provided prices are such that distance shipping is feasible. All of these plants normally use large quantities of softwood either rough or peeled, and at least one purchases substantial amounts of hardwood. Although many of these industries own sizable acreages of timberland, they buy large amounts of wood from farmers as well.

Scattered through the region are sawmills which process both soft and hardwood. One of these is owned cooperatively by a group of farmers. It serves as an outlet for high grade products and does custom sawing for home use. The lumber that is not used locally finds its way into near-by eastern markets. High grade hardwood logs find a ready market at a near-by furniture factory. If of good quality, they may be shipped considerable distances.

Actual marketing is done both by direct contact with mills and through a cooperative marketing organization set up recently to handle farm forest products. This cooperative acts as a bargaining agency, furnishes production credit to members at a nominal charge, pays cash on delivery for all products at the contract price, and co-operates with the New Hampshire Extension Service in assisting members with forest management problems.

There is a limited market for fuelwood within the area. Wood is looked upon with favor by many local people, providing the price is attractive in comparison with prices for other fuels. The expense of equipping for other fuels is also a factor in favor of using wood. One

substantial outlet is the local school system. Wood is the prevailing type of fuel used for heating the several country schools.

A network of roads and railroads serve the area; they are so laid out that practically all farm woodland is accessible throughout the entire year. In the past "drivable" streams were used to provide low-cost transportation from producer to market. In recent years this practice has been largely abandoned in favor of the truck.

LABOR SITUATION

It is evident from the records taken on the sample farms that two types of adjustments are desirable if farmers are to use their resources to the best advantage.

The first, and possibly most important adjustment because it concerns a larger group of people, has to do with greater efficiency in the use of labor already employed on certain operations. On the average, farmers in the area are engaged from 20 to 60 days each year in harvesting the products of the forest. The number of man days devoted to this enterprise on individual units varies, but the majority comes within this range. Herein lies the best opportunity to increase farm income through wiser use of the labor resource. The same amount of time spent in a different manner when harvesting would go a long way toward keeping the forest in a highly productive state. It is also evident that greater efficiency in doing routine chores would free some time for other employment. Chore time ranges from 87 to 285 man hours per cow per year⁵ whereas requirements should not exceed 200 man hours per cow per year at the most. Although it is essential to care for livestock properly there is a limit beyond which it will be more profitable to utilize the additional time on other enterprises. During the winter months this can usually be diverted to the woodland with excellent results. Few farmers have as yet practiced very intensive forest management and as a consequence at least each of the first few units of labor applied to the woodland will return relatively high dividends. Whether these dividends will be realized immediately or delayed depends largely upon the condition of the growing stock at the time work is done. The manner in which the labor is applied in either case will govern the rate of return per unit of input.

The second type of adjustment is concerned with the need for additional employment over and above that normally available. Thirty-three percent of the farmers in the Colebrook area have free time during the year which they desire to devote to some gainful enterprise. Nineteen percent of these people could use additional employment for 3 to 5 months and another 14 percent from 2 to 3 months each year. The problem is most acute during the winter months. Because of the nature of the dairy enterprise, the length of the day would be limited to about 6 hours.

At the time they were interviewed the rest of the operators, or 67 percent, indicated they personally were not interested in additional

⁵ Woodworth, Harry C. and Hargas, Arno: Opus cit.

work in the woods. Some of the reasons given were preference for other types of non-farm work, time already fully utilized with chores on the farm, and in some cases inability to do woods work. Had these people been interviewed at a time when higher prices for forest products prevailed, the number would likely have been much less.

A check of unemployment in the villages emphasizes the fact that the problem is not confined to farm people. It is, however, somewhat different in at least one respect. Whereas the farm people operate with less than full employment for only short periods and a large number are affected, a few non-farm people are in need of full time employment. Besides these, a few others need work during winter when other activity is at a minimum.

Obviously not all of these people in need of additional employment are interested in woods work. However, an opportunity for this type of work would alleviate the situation in the majority of instances. Out of a total of nearly 29,000 man days for which no gainful employment can be found in a normal year, about 21,500 man days could be used in the woods (See Table 1). These figures are based on information secured directly from the individuals concerned.

TABLE 1. ESTIMATED NUMBER OF MAN DAYS FARM PEOPLE AND TOWNSPEOPLE HAVE AVAILABLE BY SEASONS DURING NORMAL YEAR FOR WOODS WORK AND OTHER WORK.

SEASON	WOODS WORK			OTHER WORK			TOTAL
	Farm People		Townspople	Farm people		Townspople	
	Family	Hired		Family	Hired		
Winter	9,260	190	3,240	530		1,440	14,660
Spring	1,490		720	480		1,440	4,130
Summer	1,580		720	310		1,440	4,050
Fall	2,760		1,560	240		1,440	6,000
Total	15,090	190	6,240	1,560		5,760	28,840

PRESENT STATUS OF FOREST LAND OWNERSHIP

There are 64,842 acres of woodland in the three towns. For the purposes of this study the woodland may be divided roughly into three classes: (1) farmer-owned land related to operated farms, 29,721 acres; (2) land not attached to farms but held by individuals or groups of individuals in small lots, 20,973 acres; and (3) corporate holdings, largely wildlands, owned by pulp and lumber companies, 14,148 acres. Although about 46 percent of all the woodland in the area is owned by farmers and more than half that individually owned is in farms, the ownership pattern varies somewhat among towns. For instance, most woodland in Colebrook is either farmer-owned or farmer-rented. Location with respect to market for farm products, good year-round roads, topography, and similar factors have contributed to this condition. In Stewartstown and Columbia there are

a number of private and corporate holdings not connected with farms. These lands are located as scattered small lots and larger tracts in the rough hilly sections.

The land use pattern also varies greatly. In places agriculture was never of much importance. The character of the soil and topography made cultivation impractical, and these areas have remained continuously in woodland. In the back areas adjoining this land and in other places, land that was once in farms has been in the process of abandonment for many years. This land is rapidly growing up to some form of forest cover. The remainder of the woodland is to be found as a part of individual farm units.

There is considerable variation in the size of the farm woodlands. Over 50 percent contain less than 100 acres and, more significantly, 26 percent are under 50 acres (See Figs. 3 and 4). It is doubtful if less than 50 acres of woodland, under present growing conditions, will

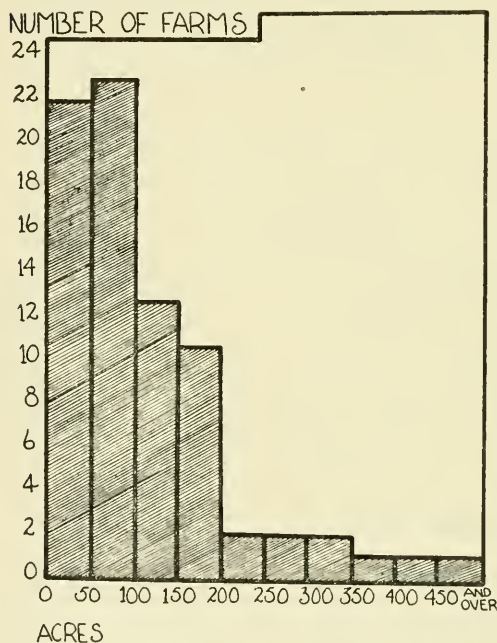


FIG. 3. DISTRIBUTION OF SAMPLE FARMS ACCORDING TO WOODLAND ACREAGE.

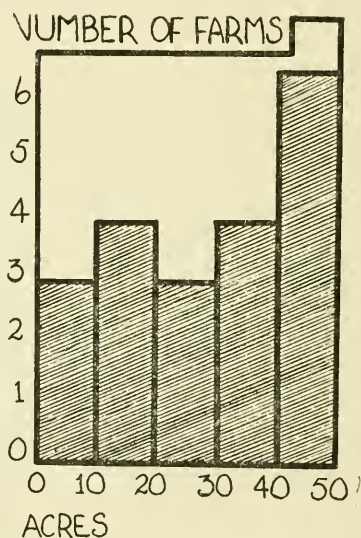


FIG. 4. DISTRIBUTION OF SAMPLE FARMS WHICH HAVE LESS THAN 50 ACRES WOODLAND BY SIZE OF WOODLAND ACREAGE.

more than meet home needs for fuel and lumber over a period of years. Under proper management this figure might be lowered to 30 acres. Even if the latter figure is accepted as the minimum, there would still be 12½ percent of the total number of farms with insufficient woodland acreages (See Fig. 4). Most of these farmers would have some material to sell because of an excess of certain species or some species

not suited to the needs of the farm. Income from the sale, however, would have to be used to purchase fuel, lumber or both. The net result would be the same as though all products were home grown.

An examination of the data indicates another 9 percent who, because of the condition of the growing stock, may be grouped with the above for the present. The lack of merchantable timber on their holdings will make the realization of immediate income impossible. Proper care of their woodlands and time can remedy the situation where acreage is sufficient.

MERCHANTABLE TIMBER

The volume of merchantable timber in the three towns was estimated in terms of cords and board foot equivalent for all species except northern white cedar and tamarack. The latter species are adapted to limited use and were estimated as poles, fence posts, and highway guard posts. Approximately 60 percent of the total volume, exclusive of cedar and tamarack, is spruce and fir, with fir the predominant species. The remaining 40 percent is largely yellow birch and sugar maple with significant stands of white birch and aspen. Other species of minor importance are white ash, red oak, beech, hemlock, basswood, red maple, and black cherry. In addition to the above industrial wood, there is a large supply of material suitable for fuelwood.

The summary figures, representing the total woodland acreage and the volume of merchantable timber on small tracts as compiled by the United States Forest Service, plus the estimated totals for corporate holdings, are presented in Table 2. Volumes are shown either as cords, board feet, or piece, depending upon the form in which the species are usually marketed.

It is evident from the data that the woodlands of Columbia and Stewartstown are generally in better condition than those of Colebrook. The acreage in small privately owned tracts is practically the same in all three towns, but the volume of timber in Colebrook is less than half that found in either of the other two towns. This is probably due to a number of factors, one of the most important being accessibility with respect to good roads and markets. Possibly the type of ownership and the opportunity for farm income has also contributed to this condition. Farmers might find it profitable to sell even at low prices provided they did the work themselves, whereas other owners not in a position to do the work would have to wait for a better market. Since the forest survey was completed, a more active market has started liquidation of some of the better holdings, especially in Stewartstown where the tax rate is highest.

TABLE 2. WOODLAND AREAGES AND VOLUMES OF MERCHANTABLE WOOD IN THE TOWNS OF COLEBROOK, COLUMBIA, AND STEWARTSTOWN, COOS COUNTY, N. H., 1940

TOWN	WOODLAND	Hard- wood	Soft- wood	SPECIES								NEW GROWTH
				CEDAR			TAMARACK			ASPEN*		
				Fence posts	Guard posts	Poles	Fence posts	Guard posts	Poles			
	acres	M. bd. ft.	cords	No.	No.	No.	No.	No.	No.	cords	cords	
Columbia	28,389	14,296	85,102	552,449	179,326	29,468	61,864	23,011	2,307	11,155	5,195	
Stewartstown	18,343	15,006	80,749	324,472	102,919	16,695	59,324	21,810	2,179	2,113	3,586	
Colebrook	18,110	5,822	35,173	360,045	117,737	18,130	24,681	8,113	711	1,948	1,772	
Total	64,842	35,124	201,024	1,236,966	399,982	64,293	145,869	52,934	5,197	15,216	10,553	

* Aspen listed separately because of specialized use.

GROWTH

Annual production for the area is at the rate of 10,553 cords for all species. There is considerable variation in growth rates among types and among towns, depending upon the age, the degree of stocking, and the relative growth rates of different species. The possibilities of increasing growth over a period of years are considerable. Although no concrete figures are available for this locality, research has indicated that a mean annual increment much greater than the present increment is feasible for the farm woodlands. Present growth rates vary from one-tenth of a cord per acre per year for some hardwoods to slightly over three-tenths for some softwoods.

It is reasonable to expect that farmers can increase the mean annual growth by three to four times the present rate by adopting approved management practices. At the same time, the quality of the timber would be vastly improved. This would be most important for that portion of the industrial wood, mostly hardwood, which ultimately goes into lumber. The increased growth and volume of softwoods would be more important than improvement in quality, which would come naturally as the result of forest management, because these species go mainly for pulpwood. A reduction in the percentage of fir in the softwood stands and the transferring of the growth to better species can be classed as an improvement in quality and is of considerable importance from the standpoint of marketing pulpwood at the local mills. Although fir is acceptable in limited quantities, spruce is much preferred by the industry.

In predicting future returns from forest management, certain basic data were used. The woodland was first classified according to its future use and cover type. For each of these types, the age of maturity, average volume per acre, mean annual growth, and percent of the total volume suitable for industrial use were determined. These figures have been arrived at after discussing the matter with foresters having considerable experience in the region working with local types and species. The information for those types which can be improved is given in Table 3.

TABLE 3. GROWTH DATA FOR DIFFERENT LAND USE CLASSES AND COVER TYPES.

		Maturity age ¹	Average volume per acre	Mean annual growth ²	Percentage industrial wood
Better hardwood	Beech, birch, maple	<i>years</i> 80	<i>cu. ft.</i> 1825	<i>cu. ft.</i> 85	<i>percent</i> 60
Softwood ³	Mainly red spruce	70	2795	82	90
Softwood — Better hardwood 25-75 mix- ture	Red spruce, beech birch, maple	80	2265	84	70

¹ Age at which trees will be ready for cutting.

² Softwood: + 95 cu. ft. = 1 cord;

Hardwood: + 85 cu. ft. = 1 cord.

³ Does not include swamp spruce type.

The figures used for spruce, swamp cedar, and tamarack types are the same for the future as the present, growth rates being determined by the Forest Service survey. These types are to be found mostly on wet sites and it is questionable whether any appreciable increase in increment could be expected, except maybe as the result of drainage. In most cases such an undertaking would be very costly and results uncertain.

It is assumed that stands of such species as aspen and paper birch will not occur when woodland is managed. In any case, it would be impossible to tell where they would be found in the future. Areas now occupied by these species have been classified according to the type that management should attempt to establish there in the future.

INCOME

The total gross cash income received from the sale of forest products, including maple products, by the 80 selected farms during the period March 1, 1935 to March 1, 1940 was \$55,826. It is significant, however, that 5 percent of the farms received 55 percent of this total. Forty-one percent of the farms made no sales of forest products (See Table 4).

TABLE 4. DISTRIBUTION¹

FROM FOREST PRODUCT SALES, 1935-40.

Income class	Farms	Percentage of total farms	Income from forest products	Percentage of total income from forest products
	<i>Number</i>	<i>Percent</i>	<i>Dollars</i>	<i>Percent</i>
None	33	41	—	—
1 - 100	11	14	797	1
101 - 200	4	5	604	1
201 - 300	6	8	1447	3
301 - 400	4	5	1446	3
401 - 500	0	0	0	0
501 - 1000	10	12	7065	12
1001 - 2000	5	6	6722	12
2001 - 3000	3	4	7164	13
over 3000	4	5	30581	55
Total	80	100	55826	100

¹The group with individual incomes from sale of forest products amounting to more than \$3000 was composed of operators of large farms. The smallest income reported by any of the four operators was \$4800, two others sold products valued at \$6086 and \$7320 and the largest income reported was \$12,375.

There are several reasons for the unequal distribution of income. Possibly the most important is the length of the period for which data were collected. Cuttings of any one farm are usually periodic and several years apart. Had it been feasible to get information covering a longer time, the distribution might have been different. There would still be a number with a very small income from this source, however, because of the lack of woodland, poor condition of growing stock, unwillingness to sell at existing prices, and alternative employ-

ment opportunities during periods when the market is particularly active.

FOREST MANAGEMENT

In the Colebrook area most farmers are in need of work during the winter months and woodland is one of the few sources, if not the only source, of employment available. To date the pulp and paper mills and other wood-using industries have offered a fairly continuous market for the farm forest products. To maximize income from farm woodlands over a period of years forest management for sustained production will be essential. The form it takes and the intensity desirable will vary in each individual case.

A few fundamental principles which apply to all woodlands must be observed if a crop of timber is to be produced. They are as much a part of forest management as are cultural treatment and harvesting. Most important among these is protection against fire and such natural enemies as disease and insects.

The first measure necessary for the successful practice of forestry is protection from fire. This enemy can cause death to standing trees, injury to trees not killed, destruction of soil humus and subsequent leaching of mineral ashes, reduction in growth rate, and insect and disease attack. In many instances it will prevent stand reproduction through effects on seed bed and the seed itself. Diligent efforts on the part of the owner, together with those of State and federal governments, can prevent much serious fire damage.

Such direct control measures are not well adapted to insect and disease control. Results are likely to be better and more economical if the approach is made through control of stand composition by silvicultural⁶ treatment. Although results cannot be expected at once through this approach, a gradual change to species less susceptible to attack appears to be the most logical method of control.

The practice of grazing livestock in the woods is often detrimental to timber production. Continued grazing destroys valuable reproduction growth and can lead to a condition of neither forest nor pasture. Under present circumstances in this area the feed obtained from this source, no matter how small in amount, may be necessary to the maintenance of the dairy enterprise. But a program of pasture improvement can largely eliminate the need to continue this practice. When and where damage is evident, fencing to prevent grazing is desirable. Usually pastures in the area contain enough tree growth to furnish shade for dairy cattle. If not, a small portion of the forest may be left accessible to them.

The protection phase of management so far discussed applies to all woodlands in the area. In general, these fundamentals must be observed if a forest cover is to be maintained. More intensive management practices will be necessary to increase growth and keep the land at near full productivity. These practices will be determined by forest type, age, condition, and other pertinent factors. The following discussion deals with them in somewhat more detail.

⁶ Silviculture — producing and tending a forest.

SPRUCE AND FIR

Successful management of the spruce and fir stands in Coos County for sustained production over a period of years has two main objectives: (1) Stands must be perpetuated through adequate reproduction, and (2) immature trees must be protected at time of cutting to permit the building up of larger growing stock. The type of cutting and the time at which it is done will be of primary importance in the accomplishment of both objectives. No set rules can be set forth for the whole area because treatment will vary with individual stands. However, certain fundamental principles can be presented to serve as a basis for making decisions regarding any particular area.

The pulpwood producer must base whatever form of forest management he practices on the presence or absence of advance reproduction growth. If desirable young growth is coming in under the older overstory, the problem will be to bring this along and at the same time cut the older timber in a way to get the most out of it. There can be considerable flexibility in handling these stands. Less flexibility is possible when reproduction is lacking. In the latter case, cutting must be of the type most likely to establish young growth before the final removal of older trees is effected. Thus the method of cutting used will depend on the ease with which stands are regenerated. The easily regenerated stands are either pure stands of spruce and fir or those in which the hardwood element is chiefly paper birch and yellow birch. On such sites there is usually sufficient advance reproduction with which to work. Several methods of cutting—single tree selection, group selection, and clear-cutting—are well adapted to these stands.

The single tree selection type of cutting should be used if possible, in order that an all-aged forest will be developed. The removal of scattered individual trees from the stands will increase growth of other favored trees. The two-fold objective of making the most of growing stock already established and of securing satisfactory reproduction should result.

The pure stands of spruce and fir may be clear-cut if reproduction is at least two feet in height at time of cutting and if the site is unfavorable to the encroachment of hardwoods. Once the old growth has been removed, the new stand will usually develop rapidly enough to compete with brush and other growth. The young growth must be protected from logging damage, windthrow and fire.

The management of the mature mixed hardwood-softwood type will be governed largely by economic factors. If the market is favorable, best results will be obtained by removing all merchantable hardwood and softwood at the same time. Demand for hardwood pulp in the Colebrook area should make such a practice feasible. Reproduction in this case should be at least four feet in height prior to cutting. Eight to ten years after logging, one weeding likely will be necessary to insure the maintenance of the spruce composition ratio. Undesirable species should be cut back to prevent their overtopping the slower growing spruce.

Stands consisting of dense, even-aged, often immature, spruce and fir, and of a mixture of spruce, sugar maple, beech and other hardwoods are difficult to regenerate. It may not be possible to maintain pulpwood species on sites particularly adapted to hardwoods without great difficulty. In all cases, virgin forest composition should be the guide for silviculture. Although it may appear economically sound in the short run to attempt pulpwood production, doing so may lead to disastrous results over a long-time period.

In the dense, even-aged, second growth spruce and fir stands, advance reproduction is usually lacking. This situation is very common on farms in the Colebrook area. Best results will be obtained by a shelterwood cutting, removing from one-fourth to one-half of the trees. The first cut should include inferior and slow-growing trees, especially fir, leaving the best trees for continued growth. Once reproduction of a desirable character and size has been established, the remaining old growth may be cut. Care must be taken to prevent windthrow in these stands during the intervening period. It may be necessary to make a series of light cuttings, removing only a small portion of the total volume each time in order properly to protect the trees left for additional growth.

Where spruce grows with hardwoods, the aim of management should be to maintain the mixture. It may be desirable in some instances to increase the proportion of spruce. This proportion can be increased by removing the hardwoods several years before cutting the softwoods. Such a procedure accomplishes the two-fold purpose of encouraging conifer reproduction and stimulating growth of the merchantable spruce stems. On many of the farm woodlands, the present hardwood is of inferior quality and should be removed in this manner for fuelwood. In the future, attention should be given to raising better quality hardwood and spruce on a somewhat longer rotation to produce sawlogs. Weeding, thinning and improvement cutting during the rotation period should produce a quality product at maturity. The inferior trees should be removed in all these operations. Except in weeding, they will yield fuelwood for home use.

HARDWOOD

The hardwood stands of the area are composed mainly of yellow birch, sugar maple, red maple and beech. Occasionally white ash is in the mixture. There also are stands of aspen and paper birch which have followed clear-cutting. The objective of management should be to improve the quality of the stand and to build up a larger growing stock so that products will be available for market each year or at regular short intervals. The accomplishment of this objective will mean following certain cultural practices and changing the type of cutting now prevalent.

In general, cutting should be so light as to create no radical disturbance in the forest cover. A single-tree-selection method of logging will be the most satisfactory. In the farm woodlands, where the

better species and better trees have been removed in the past, cutting should be confined to inferior trees which are interfering with the development of more desirable trees and to trees which have reached maturity. The cut should be well distributed through all size classes down to the minimum that can be used for fuel.

The first cut, which should be very light, will bring about only a slight change. Improvement will be gradual until much of the present inferior growth has been replaced by trees of desirable species and quality. Although most farmers with such stands will have little to sell except fuelwood in the near future, they can supply their own needs for fuelwood and build up a stand of future value as well. Little if any, time in addition to that already spent in getting the year's fuel, will be required. It will mean using the same amount of time in a different manner.

If yellow birch is an important component of the stand, a slight variation in the type of cutting may be necessary. Yellow birch will not withstand any appreciable opening up of the crown canopy. A group selection system, confining the size of the area cut at one time to one-fifth to one-fourth acre plots is best suited to this species. The resulting stand will be even-aged as compared with all-aged stands resulting from single tree selection.

The young stands of sapling size should be given some attention to insure a desirable composition and to secure maximum growth. Cleaning is particularly important where the proportion of sprouts is large. Trees selected to be favored should be either seedlings or seedling sprouts when possible. In the absence of a sufficient number of seedlings, individual sprouts of the most decay-resistant species arising from stumps under four inches in diameter should be favored.

Aspen and paper birch types occur on some of the cut-over areas. For the most part, they are of little commercial importance and are used principally for fuel. The aim of management should be the conversion of such stands to a northern hardwood type. The character and quantity of advance reproduction will determine the treatment necessary to accomplish conversion. If reproduction is adequate, removal of the over-story of birch or aspen in one operation will usually create favorable conditions for the development of the new stand. Heavy partial cutting may be advisable in very dense stands where advance growth has been weakened by competition for existence. A second cut may be necessary at a later date, although, if the bulk of the undesirables are birch, mortality after cutting may make additional treatment unnecessary.

If advance reproduction is lacking, there is little that can be done except to wait or plant. Probably the best procedure is to wait until reproduction does become adequate and then begin conversion.

RELATING PEOPLE TO RESOURCES

A number of local people are in need of additional employment during the off seasons. There are limited opportunities to use labor

and in some cases equipment such as trucks in off-the-farm work. In this connection, the forest resources of the area offer possibilities. Timber products can be harvested in the late fall and winter when they do not compete with other crops for the use of labor and equipment.

Time in which to carry on cultural treatment of the woodland is not nearly as limited as is the case with other crops. Although weedings, improvement cuttings, and the like must be made to get maximum production, it is not necessary to complete the operation in any one year or growing season. Rather it may be spread over a period of several years as the individual case may indicate. Even by doing nothing more than making cuttings to fit the needs of specific stands to insure natural regeneration, woodlands can be kept in relatively continuous production. Granted that growth rates would be less than under more intensive management, there would still be something produced to market each year.

The fact that up to a certain point timber continues to grow even though no work is done is highly important. If for any reason it becomes impossible to harvest during any year or few years, it can be stored as growing timber until such time as it becomes possible to market it. This is a decided advantage over other crops common to the area which must be harvested each year and can be stored for a limited time only. Market conditions prevailing over the last 20 years also indicate that pulpwood is the most saleable asset on the farm.

Many farmers in this area would do well to give some consideration to forest management as a means of increasing farm income. A few have attempted to increase earnings by buying tracts of timberland. For the most part, these have been exploited with hired labor and have become a liability rather than an asset once the timber was removed.

The size of woodlands on most farms is governed as much by historical as by economic factors. An operator has a certain acreage of woodland because that much of his farm either was never cleared or has reverted to tree growth when abandoned for agricultural uses. Farmers have attempted to adjust the size of the dairy herd and the acreages of crops to fit their situation but seldom, if ever, have they done so with woodland. A number of alternative methods of making better use of existing forest resources warrant consideration here.

One alternative applies to those farms now having sufficient acreage and growing stock to utilize most or all of the available labor and equipment. In the past the predominant policy has been to remove all merchantable growth from an area without particular regard to the future stand. Often stands are dense and even-aged with little or no advanced reproduction at the time of cutting. Consequently, after logging, these areas have been taken over by such light-prefering species as birch and aspen. Because of their rapid growth, these species have been able to dominate for several years. The result has been a lengthening of the rotation period for a quality crop and low

returns to the owner. In many instances labor has been hired for the specific purpose of removing all timber in a single operation.

The first step necessary to make greater use of resources involves a change from exploitive to more conservative forest management on these areas. Rather than hiring forest laborers and selling all merchantable timber at one time, farmers could spread the operation over a period of years and use their own labor and equipment to advantage. Present practices yield only a stumpage value plus a return for that portion of the operation carried on with farm labor. By adopting a policy of sustained-yield management farmers could expect an increase in income from at least three or possibly four sources.

First, by using their own labor and equipment, for which there is no other market, net earnings would be increased. This, of course, assumes a continuous market to permit sales each year or at regular, short intervals. Such is the case in the particular area studied. But in some locations and under certain price conditions it might be desirable to alter this policy. If prices were at any time high enough to make stumpage values abnormally high, it might be more profitable to hire labor and sell a large quantity at that price. The additional cut could take the form of removal of several years' growth or it might even be desirable to cut somewhat heavily as long as productivity is not seriously impaired. Such a procedure would be particularly desirable in locations where stumpage value is normally low. For those farmers near to markets, the advantage gained through hiring labor during such a period and making a heavy cut could well be offset by the decreased growth due to reduction in growing stock and consequent lengthening of the rotation period.

Second, higher income due to better management would result from greater production per acre over a period of years. These three towns are located advantageously with respect to market. Should demand for forest products continue about the same as in the past, there would be little difficulty in disposing of the increased production. With little or no additional out-of-pocket cost to the farmers, the higher returns would be largely reflected in net incomes.

Further increase in income might be expected from improvement in quality. More complete utilization of each tree for a higher grade product would be possible. At present a large part of the stand is suitable only for fuelwood for which there is little demand. Proper care can be expected to keep this proportion to a minimum.

A few farmers might also get more income because of higher prices for quality products. Some operators would get under way faster than others and some would have a better foundation upon which to build. As the volume of the better grades increased, however, there would be a tendency for this advantage to disappear.

A second group of farmers are those who have large acreages of woodland supporting little or no material ready for market at present because of the condition of the growing stock. Such areas may be poorly stocked with desirable stems or well stocked with young, growing timber not yet ready for cutting. Forest management could in time increase production to a point where most of the available labor

could be used in annual harvesting. Until such time, employment opportunities on these areas would be limited. Certain cultural operations such as weedings, thinnings and improvement cuttings during the transition period would furnish an outlet for some labor and yield fuelwood for home use and for sale. In some cases, a limited quantity of industrial material may be removed to improve future composition or growth. Substantial returns in cash will necessarily be delayed until growing stocks have been sufficiently built up to permit logging.

During this build-up period, these farmers could relate themselves to near-by forest resources of non-farmers who have material to market. There are a number of such woodlots scattered throughout the three towns which at present support merchantable timber. The majority of the owners do not desire to do the logging themselves and may find it necessary to hire supervision to look after their interests while the operation is in progress. Others prefer to sell the stumpage, relieving themselves of all responsibility except to check the scaling of the wood. Such holdings can and do offer seasonal employment to local people. If properly managed, they can continue to do so indefinitely, provided, of course, that they are not damaged by fire or some other destructive agent.

A third group of farmers are those having small woodland acreage who, regardless of intensity of management, would find it impossible to produce enough to make a material contribution to farm income.

Over a short period, a satisfactory solution to the problem of this group might be reached through employment in the woodlands of others. At best, however, this would be only a makeshift arrangement because they would have no control over the management or cutting practices. They would always be subject to the will of others and unless the owner desired to keep his lands productive and make frequent cuttings, employment would be at irregular intervals on any particular holding. Inasmuch as farm operators must find work near home in order to carry on other farm enterprises, the number of holdings accessible to them is limited and future employment opportunities rather uncertain.

From a long range viewpoint, they might do well to consider obtaining control of additional woodland. Ownership would permit a continuity of policy with regard to the management of these lands best suited to meet the needs of each individual. The ownership pattern is such that in much of the area forest land owned by non-farmers is in proximity to operated farms. In the short period of one year or less since property maps were completed for the three towns, many changes in ownership have taken place. The fact that timberlots are continually changing hands indicates that there is land for sale at a price prospective owners are willing to pay. Information obtained from local residents suggests that it may not be possible to purchase advantageously in any particular year, but over a period of a few years the situation would change. If a farmer needs additional woodland to make his farm more nearly an economic unit, he would be able to buy it at a price economically feasible. In the past most of this land has been bought by people for investment or speculation. There

are probably a number of reasons why farmers have not figured prominently in such transactions, the chief ones being lack of capital and lack of knowledge that the land was for sale.

PROBLEMS AND ADJUSTMENTS ON REPRESENTATIVE FARMS

In this area there are a number of possible adjustments in farm organization and practices by which farmers might make better use of their resources and improve farm incomes. These, with the exception of woodland possibilities, have been discussed at some length in a recent publication.⁷ The most promising appear to be:

1. Improved management of woodland and adjustment in size of this enterprise to make the individual farm more nearly an economic unit.
2. Better livestock and dairy herd management to permit sale of good cows, especially during periods of low milk prices.
3. More efficient feeding of concentrates and adjusting feeding under different price relationships.
4. Greater efficiency in the use of labor on daily chore work to find time for other productive work.
5. Changed practices in harvesting hay to get the crop cured and under cover at the proper time.
6. Pasture improvement for the two-fold purpose of better roughage production and as an aid to forest management. Greater carrying capacity of pastures would permit the elimination of grazing in farm woodlands.
7. Improvement in quality of roughage by better management of cropland. This may involve changes in acreage devoted to certain crops, and the adoption of definite rotations.
8. Adjustment in size of herd in a few cases to bring it more in line with available resources.

These adjustments are not necessarily listed in the order of their importance. Their adaptability will vary; one or several may apply in specific cases. Many farmers in the area have considerable time available for woods work even with present methods of handling livestock and crops.

The adjustment in other farm enterprises on other farms necessary to the inclusion of forest management involves changes in methods more than changes in size of enterprises. For example, the dropping or adding of one or two cows would make little difference in the time free for other work. The elimination of enough cows to make any great difference in labor requirements would seriously dis-

⁷ Woodworth, Harry C., and Hansas, Arno: *Farm Organization and Management in the Colebrook Area*, N. H. Agr. Exp. Station Bul. 322, June 1940.

rupt the farm economy. Much the same is true for potatoes, the main cash crop on most farms. A small acreage of potatoes utilizes to advantage some labor and equipment and is an important factor in maintaining yields of hay in the rotation. From the long-time viewpoint the resultant reduction in farm income would hardly be replaced by the income received from woodland management. Greater efficiency in doing chores or in the handling of a crop, however, would make more time available for other productive work.

For the purpose of illustrating the place of woodland in the farm organization and the effects of adjustments on net farm incomes, both in the immediate future and over a period of years, three farms have been selected for case analysis. These farms represent situations with respect to organization and desirable adjustments commonly found in the area.

It should be kept in mind that the full results from suggested shifts in organization and practices would not develop immediately. Pastures must be improved and cropland put into rotations before yields can be raised. However, in no case are suggested changes likely to reduce net income below the present level during the adjustment period.

Maximum annual income from woodland will not be realized until growing stocks have been built up and forest lands are somewhere near fully productive. Because the transition period is likely to be long with the woodland enterprise, income possibilities from forest management have been shown for both a short and long-time period.

In each case analysis, prices considered normal for the area and yield based on experience of a number of farmers in the region have been used.

A Medium Size Dairy-Potato Farm with a Substantial Acreage of Woodland

Farm A

Farm A is a two-man farm with a large acreage of woodland. It is representative of a group, particularly in Columbia and Stewartstown, which has a substantial acreage of woodland attached to farms. The present organization of the farm is shown in Table 5. The labor supply consists of the operator, his son, and a small amount of day labor at odd times. Buildings are in good condition and adequate. All equipment is adapted to horses and some of it suited to harvesting forest products.

TABLE 5. PRESENT ORGANIZATION OF FARM A

LAND USE AND CROP PRODUCTION			FINANCIAL SUMMARY	
KIND	ACRES	PRODUCTION	ITEM	VALUE
Hay	50	60 tons	<i>Income</i>	
Oats, grain	5	164 bu.	Milk, 602 cwt. @ \$1.70	\$1,023
hay	(5)	4 tons	Livestock	172
Potatoes	5	1400 bu.	Potatoes, 1250 bu. @ \$.60	750
Open pasture	25		Forest products, 31 cds. @ \$6.50	200
Woodland pasture	173		AAA payments	40
			Miscellaneous	118
Total	258		Total cash income	\$2,303
LIVESTOCK			<i>Expenses</i>	
			Grain, 7.5 tons @ \$35	\$ 262
			Livestock	25
			Seed, fertilizer and lime	200
			Taxes and insurance	127
			Building upkeep	200
			Equipment upkeep	160
			Hired labor, 13 days	27
			Miscellaneous	133
			Total cash expenses	\$1,134
			Net cash income	\$1,169

The most promising adjustments which the operator of Farm A might initiate to make better use of his resources and to raise his farm income are as follows:⁸

1. Adoption of definite crop rotations to insure adequate roughage production. One 22-acre field with a well drained loam soil is well suited to potato production and should be managed on a four year rotation with potatoes followed by oats and hay. The application of a complete fertilizer on the potato crop and the application of manure once in the rotation would increase the productivity of this land. Liming of this field, except on a very limited scale, will not be desirable. The other 34 acres should be managed on a six year rotation of oats, clover and hay. Lime, manure, and superphosphate should be applied with each reseeding.
2. An aggressive pasture improvement program should be followed, selecting the better areas for improvement. Where the forest is encroaching on the pasture, young trees should be removed. The four acres of tillage land no longer devoted to crops should be maintained as rotation pasture for supplemental feeding during the late summer. Better feed during the latter part of the pasture season is needed on this farm and on a large percentage of the farms in this area.
3. Greater efficiency in the use of labor and equipment in harvesting hay. On this farm and on at least one-third of the farms in the area, the quality of roughage can be improved

⁸ For more detail on adjustments 1 and 2, see pages 36-39 in *Farm Organization and Management in the Colebrook Area*, by Harry C. Woodworth and Arno Hangas. N. H. Agr. Exp. Station Bul. 322, June 1940.

greatly by use of improved methods in curing and getting the hay crop under cover.

4. Increase the size of the dairy herd by the addition of four cows. This does not represent an adjustment for very many farms and where it can be made, it is unlikely that the number added would be as large. There would be ample feed for the increased herd with a system of crop rotation.
5. Manage the woodland as a part of the farm business. This operator, like most of the others, cuts his own fuel supply. Like many, he also cuts some forest products for sale each year. The same amount of time applied in a different manner would go a long way toward bringing about desirable woodland management.

All of these changes probably could be handled for some time with the present labor supply and equipment. The woodland adjustments would be essentially the same whether or not the others were made.

Even with 18 cows on the farm, approximately 100 man days of six hours each would be available for woods work. This would be sufficient to carry on the necessary work for the next few years. As the allowable annual cut increases, say after ten to fifteen years, some contract labor will be required to harvest a portion of the crop. This problem can easily be worked out with some other operator who does not have enough woodland to meet his employment needs. At least two near-by farmers are interested in additional work.

The 173 acres of woodland support a fair stocking of desirable species and much of the area is ready for partial cutting that will yield marketable products. Woodland management in the form of a single tree selection cutting should be started at once in the more dense stands of softwood. The first cutting should be light with the view to returning to the same area at five-year intervals. Such frequent working of the same area combined with careful observation will enable the operator to maintain a check on the relationship between growth and removal, and to prevent loss of timber from death or windthrow. Spruce should be favored over fir where possible.

In one section of the lot a selective cutting has already been made in a stand of spruce and fir overtopped by hardwood. Although it probably would have been preferable to remove the hardwood first, the treatment given will yield good results. As soon as the remaining softwood has become more firmly established against wind damage, the hardwood should be removed. This job must be carefully done to avoid damage to the understory, and is a type of operation best done by the owner and regular farm labor.

The availability of a market for rough pulp will permit cutting during the time when chores offer the only other outlet for regular farm labor. During June, when there may be some free time, a few cords could be peeled, giving the operator a small additional return for his labor. Cutting during the peeling season, however, should not be allowed to interfere with other crop production. The slight gain

due to difference in value between peeled and rough wood could easily be offset by failure to care properly for potatoes or to start hay harvest on time.

In the immediate future the cut should be limited to home fuel supply from improvement cuttings and about 31 cords of pulp annually. Once the woodland has been built to near full productivity, it should permit an annual cut of 120 cords of pulpwood and sufficient material for home use. During the build-up period the harvest can be gradually increased but should be maintained at the present level for the next ten years at least.

Ultimately an additional 89 cords of pulpwood could be cut annually as a result of proper care of the present woodland acreage. Additional receipts and expenses from woodland for this long-time period, assuming no increase in taxes, are estimated as follows:

Additional cash receipts, 89 cords @ \$6.50	\$578
Additional cash expense, hired labor, 60 cords @ \$3.50	210
Additional net cash income	\$368

A Large Dairy-Potato Farm with a Small Acreage of Woodland

Farm B

Farm B has a good-sized dairy and a small depleted woodlot. It is representative of a group of farms located mostly in the intensive farming sections of the area where a large percentage of the land is under cultivation or in pasture. It is essentially a two-man farm and the operator, like about one-third of the farmers in the area, has indicated that he would be interested in and able to handle additional woods work in the winter.

The present organization of the farm is shown in Table 6. Buildings and equipment are adequate for livestock kept and crops produced. The horses and some of the farm equipment are well suited for woods work.

There are a number of possible ways by which the operator might make better use of the resources at his disposal to increase farm income. However, these adjustments are essentially the same as those applying to Farm A with the exception of the woodland enterprise. They probably could be handled with the normal labor supply.

The farm now has 53 acres of woodland which has been somewhat depleted, but it is capable, with proper care, of producing a small income. Demands for fuel have reduced the percentage of hardwood in the stand to a point where it has been necessary to purchase stumpage near-by to meet farm requirements during the past few years.

TABLE 6. PRESENT ORGANIZATION OF FARM B

LAND USE AND CROP PRODUCTION			FINANCIAL SUMMARY	
KIND	ACRES	PRODUCTION	ITEM	VALUE
Hay	72	100 tons	<i>Income</i>	
Oats, grain	8	400 bu.	Milk, 135,000 lbs. @ \$1.70	\$2,295
hay	(8)	11 tons	Livestock	320
Silage corn	6		Potatoes, 1500 bu. @ \$.60	900
Potatoes	6	1800 bu.	Forest products 5 cds. @ \$7.00	35
Open pasture	85		Miscellaneous ¹	592
Woodland pasture	53		Agricultural conservation	80
Total	232		Total cash income	\$4,222
LIVESTOCK			<i>Expenses</i>	
KIND	NUMBER		Grain, 20.6 tons @ \$35	\$ 721
Cows	30		Livestock	65
Young stock	21		Seed, fertilizer and lime	386
Bulls	1		Tractor, truck, etc.	415
Horses	4		Taxes and insurance	318
Brood sows	1		Building upkeep	150
Pigs	8		Equipment upkeep	200
			Hired labor, year, 12 mo.	360
			Hired labor, other, 3 mo.	101
			Miscellaneous	91
			Total cash expenses	\$2,807
			Net cash income	\$1,415

¹ Mostly off farm work with truck.

It is estimated that the operator can safely remove about ten cords of wood annually for the next few years. Roughly half this amount would be suitable for pulpwood and the rest can be used as fuel. Removals should be in the nature of improvement cuttings designed to improve the quality and composition of the stands and to attain sustained production on a relatively high level. Trees selected for cutting during the first operations must necessarily be of inferior quality. Spruce rather than fir should be cut, and the better young hardwoods can be encouraged by the gradual elimination of undesirable competing species.

The cutting practices outlined would immediately begin the build-up process necessary to raise and maintain production at a reasonable level. Provided the work is done by present farm labor, an annual net cash income of \$35 in the immediate future can be expected. After a period of ten to twelve years it should be possible gradually to increase the cut. It is estimated that when nearly full productivity is reached, an annual net cash income of \$210 from the 53 acres of woodland could be maintained if taxes do not increase.

This farm, however, like about 26 percent of the farms in the area, has insufficient woodland to utilize fully present labor supply, even after the other adjustments are made. Another 60 acres could be handled to advantage and the acquisition of this amount of fairly well-stocked forest would add materially to farm income over the

years. When the cut becomes sufficiently heavy to demand additional labor⁹ it can be secured on a contract basis to do the cutting. The operator then will find it advantageous to use the regular farm labor force and the four horses for yarding and for procuring the home fuel supply. Any remaining time can be used for cutting pulpwood. In this way it will be convenient for him to maintain close supervision over the cutting operation and at the same time make the best use of labor and equipment.

There is a woodlot of 61 acres fairly well-stocked with spruce and fir, within one mile of the farm. This can probably be bought for \$2.00 an acre for the land and \$2.50 a cord for the stumpage. It is suggested that this woodlot be purchased by the operator and managed along with his other woodland.

Cutting practices should be essentially the same on this area as on his home lot. The cut for the first few years will be somewhat larger because of the far better condition of this lot from the standpoint of merchantable timber and reproduction. A light single tree selection cutting is suggested, removing fir or inferior spruce trees where better individual trees will benefit from the increased growing space. Crown development is essential to rapid growth and a light removal should result in a greatly accelerated increment.

Because of limited acreage, good growing conditions and the nature of the farm business, rather intensive woodland management by proper harvesting appears advisable on both the home farm and the purchased lot. The ultimate objective should be the development of an all-aged forest. This type of forest requires less capital growing stock than the even-aged forest for the same production. It also permits frequent light cuttings on the same area, thus keeping loss due to natural causes at a minimum and permitting the operator to harvest all the wood grown for sale or for home use.

The immediate effect of the purchase of the 61 acres of woodland on farm income, in addition to meeting farm demands for fuel, is estimated as follows:

Additional cash receipts, 16 cords @ \$7.00		\$112
Additional cash expense:		
Interest, \$1200 @ 5% ¹⁰	\$60.00	
Taxes	33.00	93
Additional net cash income		<u>\$ 19</u>

At the same time the stand would be improving and at the end of about 25 years the income to be expected from the 61 acres would be approximately as follows:

⁹ Two-man farms in the area tend to have less livestock or smaller enterprises generally than Farm B; for this reason many farmers will be able to do all woods work with normal labor supply. Others can use this as a means of employing during slack periods the labor supply essential to the proper carrying on of other farm enterprises.

¹⁰ It has been assumed that money for the purchase of the additional woodland acreage must be borrowed at the going rate of interest for such a loan, namely 5 percent. It has also been assumed that the loan will be amortized over a period of years from the sales of forest products but that amortization will be delayed until management has built up present depleted growing stocks.

Additional cash receipts, 46.4 cords @ \$7.00		\$325
Additional cash expense:		
Interest, \$1200 @ 5%	\$ 60.00	
Taxes	33.00	
Hired labor, 31 cords @ \$3.50	108.00	201

Additional net cash income \$124

It appears that the operator can reasonably expect at once an annual net income of about \$54 from the 114 acres of woodland. Within 25 to 35 years, the woodland under management, can reasonably be expected to contribute about \$334 to the net farm income.

A Small Dairy Farm with Little Woodland Farm C

Scattered throughout the area are a number of small dairy farms with little or no woodland. The resources and organization of Farm C are typical of the group.

The farm contains 155 acres of land. Forty-eight acres are devoted to crop production, 5 acres to tillable pasture, 35 acres to permanent open pasture, 49 acres to wooded pasture and 18 acres to woodland. Livestock kept includes 13 cows, 9 young stock, 1 bull and 2 horses (Table 7).

TABLE 7. PRESENT ORGANIZATION OF FARM C

LAND USE AND CROP PRODUCTION			FINANCIAL SUMMARY	
KIND	ACRES	PRODUCTION	ITEM	VALUE
Hay	42.5	45 tons	<i>Income</i>	
Oats	4.5	225 bu.	Milk, 585 cwt. @ \$1.70	\$ 994
Potatoes	1	300 bu.	Livestock	74
Open pasture	40		Potatoes, 250 bu. @ \$.60	150
Woodland pasture	49		Forest products	40
Woodland	18		Miscellaneous	43
			Agricultural conservation	40
Total	155		Total cash income	\$1,341
LIVESTOCK			<i>Expenses</i>	
KIND		NUMBER	Grain, 10 ton @ \$35	\$350
Cows		13	Livestock	25
Young stock		9	Seed, fertilizer and lime	95
Bulls		1	Tractor, truck, etc.	24
Horses		2	Taxes and insurance	75
Pigs		1	Building upkeep	46
			Equipment upkeep	30
			Hired labor, 1½ mo.	50
			Miscellaneous expenses ¹	151
			Total cash expense	\$846
			Net cash income	\$495

¹ Includes purchased hay.

Hay yields are low, making it necessary to harvest poor quality hay from the pasture and to purchase standing hay on near-by land. The 18 acres of woodland support merchantable timber but can hardly

be expected to produce enough material for home use. It offers very little opportunity for employment and has contributed nothing in the way of cash income during the past five years.

The 49 acres of wooded pasture, like so many in this section, are of little value as pasture in their present condition. Continued pasturing will also greatly delay the time when the woodland will yield an annual crop of forest products.

The operator of Farm C is faced with about the same problems of crop rotation, more and better roughage production and pasture improvement, as are encountered on Farms A and B. Adjustments in practices similar to those recommended for the other farms would be desirable both from the standpoint of conservation and income expectancy.

There is one problem encountered on Farm C and on many of the units typified by this farm which was not found on either of the two farms previously discussed. This is the problem of unused available labor in the spring before haying and in the fall after haying. A suggested adjustment in organization to remedy this situation would be an increased acreage of potatoes. On Farm C, three acres of potatoes would fit in very well with a desirable crop rotation system.

As already pointed out earlier in this section, a small acreage of potatoes is an important factor in maintaining hay yields. It is imperative that roughage production be increased and quality improved if present livestock numbers are to be maintained economically. The increased roughage production as a result of better rotation and fertilization could be expected to meet the requirement adequately in a relatively short time.

The estimated effects on income of adding two acres of potatoes are as follows:

Additional cash receipts, 500 bu. potatoes @ \$.60		\$300
Additional cash expenses:		
Spray	\$10	
Seed, 40 bu. @ \$.75	30	
Fertilizer, 2 ton @ \$35	70	
Labor	45	
Equipment	20	175
Additional net cash income		\$125

After making the desirable adjustments in organization discussed to this point, there would still be a period of about three months in the fall and winter during which the operator's resources would not be fully utilized. An increased acreage of woodland from which to harvest an annual crop appears a most logical adjustment to make in this case.

As the farm is now organized, little return is derived from the 49 acres of wooded pasture. Because of the size and persistence of softwood reproduction, the maintenance of the whole area in pasture would be difficult. Twenty-four acres of the 49 are well suited for improvement as pasture. These 24 acres, together with the present

40 acres of permanent open pasture, would furnish adequate pasture. The remainder of 25 acres could be fenced to prevent grazing and returned permanently to woodland, making a total of 43 acres which would be enough at near full productivity to take care of the operator's spare time. In the immediate future, the annual cut should be limited to five cords of pulpwood plus the home fuel supply. After a period of about 15 years, the cut can be increased gradually as the younger stands become fully stocked. They then will benefit from the removal of the overstory of older trees now present in the area used as pasture. Eventually, a cut of around 30 cords of pulpwood should be possible each year. With all harvesting done by the operator and with no increase in taxes, the additional net cash income from this cut would approximate \$140 annually.

Where an adjustment of the type just outlined is possible, it appears desirable for farms in this group. Others should attempt to purchase sufficient acreage to meet their normal needs.

WAYS IN WHICH VARIOUS AGENCIES MAY ASSIST IN BRINGING ABOUT ADJUSTMENTS IN THIS AREA

The Forest Products Association, the local farmer cooperative organized to market forest products, probably can make the most significant contribution to bring about the adjustments that have been suggested for this area. Already this organization, with the assistance of the New Hampshire Extension Service, has gone a long way toward bringing about better use of the forest resources. By furnishing a market and advancing operating funds to members when needed, the cooperative has enabled many farmers to carry on woods operations. A continuation of this program is highly desirable.

From the standpoint of the local people it would also seem desirable to have a sizable proportion of the forest land managed in such a manner that sustained production would result. Annual harvesting of the crop would offer a market for local labor during slack periods and tend to stabilize employment over a period of years. But, there are several obstacles that stand in the way and make the realization of the objective difficult. The large group of non-farm owners have, for the most part, other business interests that yield a much greater return for their time than could be expected from woodland management on so small a scale. To carry on woods operations, both supervision and labor must be employed. The cost of hiring a competent individual to supervise a single small operation would be, in most cases, prohibitive. This service could be offered by the cooperative, however, spreading the cost over a large number of such jobs. One of the present normal functions of the organization, namely, scaling wood, requires at least the part-time services of two men. Trained foresters employed for this purpose might also supervise logging, mark timber for selective cutting, and do the surveying work requested by members. The availability of these services would assist owners desiring to put their woodland under the type of management likely to give the greatest return over a period of years.

In this connection it should also be pointed out that a marking service would be an important supplement to education in getting farmers started on a program of forest management. Taking the owner into the woods when trees are actually marked for cutting should bring about a better understanding of the basic principles involved in sustained timber production.

It has already been stated that the non-farm owner often needs to hire woods labor for logging. This work is usually done by contract and is not necessarily available to local people. The cooperative could contract to carry on logging and make delivery to insure itself adequate income to defray expenses and at the same time be of service to members by arranging with them to do the actual work.

Under the present system of cutting, most individuals market sizable amounts of wood at one time. A trucker can get employment for himself and truck for a fairly long period by contacting a few people. Consequently, he has been able to adjust charges to fit conditions, contracting at lower prices for large jobs. But the situation would be different if most people were managing their woodlands and cutting something each year rather than periodically at relatively long intervals. The majority would have to reduce greatly the amount marketed in any one year during the build-up period and, because of limited acreages, many farms would still have relatively small annual cuts once growing stocks have been built up to the desired point. It would appear that with transportation as unorganized as at present, trucking cost to producers would be increased. Usually a farmer with only a few cords would have to pay a premium unless the wood was so located as to fit in well with the transportation of larger amounts.

Sustained production, however, would permit better organization, and hauling contracts might be handled through the central marketing agency. The cooperative could ask for bids on hauling all or any part of its purchases. In this way the truck owner would need to deal with only one person to get the desired employment and thus effect the same economies as when contracting for large lots with individual owners.

A continuation of the intensive educational program now being conducted by the Extension Service should materially aid in bringing about many desirable adjustments. The forest management plans for individual farms will serve as a definite guide for the farmer in managing his woodland. Provided as it is with intimate knowledge of ownership and forest conditions, the Extension Service might go a step farther with these plans by pointing out to individuals with insufficient woodland the lots near at hand that would fit in well with their other enterprises to make the farm more nearly an economic unit.

Long-term credit at a low rate of interest is needed to facilitate the buying of forest land. Loans made for only short periods at existing rates of interest do not meet the needs for buying woodland to be managed on a sustained yield basis. Income at first is likely to be small and only when lands are nearly fully productive would they carry the load. In the meantime income from other farm enterprises

would have to be used to make payments. A credit agency that could make loans at a low rate of interest, requiring no payments on principal until returns from the forest could care for them, could make a material contribution toward solving the problem.

Production credit is being furnished by the cooperative and answers the purpose very well. This might be extended to permit farmers desiring more work to purchase stumpage for operating during slack periods. At present, many find such a procedure impossible due to lack of sufficient funds.

SUMMARY

In the past farm people in northern Coos County have found seasonal employment in the forests. More recently conditions have changed, making it difficult for a number of these people to utilize fully their labor and equipment. By reorganization of their farm business many farmers could make greater use of resources and obtain a higher income over a period of years. Possibilities include production of more home grown feed, better pastures, raising more dairy herd replacements for sale, better livestock and woodland management and acquisition of more sufficient woodland acreage. The better management of woodlands and livestock seem to offer the greatest promise.

Approximately 80 percent of the farmers in the area have sufficient woodland to develop a profitable timber enterprise. By adopting a plan of woodland management on these farms it is reasonable to expect that annual growth can be increased three to four times over the present rate, which is quite low. With few exceptions, this increased production can be brought about with little or no additional out-of-pocket cost to the farmer. Thus it should be reflected directly in net farm income. The data on farms analyzed indicate that net income from managed woodlands would normally represent one-fourth to one-half the total net farm income. At present it represents a much smaller proportion. During the period 1935-40 inclusive, only about four percent of the farms studied received 50 percent of their total income from sale of farm forest products in the area. Over the same period, 41 percent made no sales of forest products.

The Forest Products Association, by furnishing certain services such as supervision and contracting with non-farm owners to carry on logging, could assist farmer members in securing seasonal employment until such time as they have something to market from their own lands. To bring about the desired adjustments in woodland acreage, some sort of long term credit is likely to be essential.

About 12 percent of the farms in the area do not have sufficient acreage of woodland to provide a significant contribution from this source. Another nine percent, because of the condition of growing stocks, will realize little cash income from sale of forest products for a number of years. The solution to their problem appears to be for the farmers either to buy land with some timber, buy stumpage for

operating, or work for others in preparing wood for market. The ownership pattern in the three towns studied shows that such a plan is feasible.

If a farmer desires to increase his forest holdings to make a more nearly economic unit for himself, and finances are available, satisfactory results can be expected in time.



